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10/782,634	02/18/2004	Christopher J. Freitas	T-6264	5168

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EXAMINER	
SILVER, DAVID	

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 10/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/782,634	FREITAS ET AL.	
	Examiner	Art Unit	
	David Silver	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/7/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-10 are pending in Instant Application.

Information Disclosure Statement

2. The information disclosure statement(s) (IDS) submitted on 5/7/04 is/are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement(s) is/are being considered by the examiner.

Requirement for Information / Duty to Disclose

3. **The listing of references in the specification (pages 23-25) is not a proper information disclosure statement.** 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

4. Applicants appear to have used a number of documents as a reference to the Instant Application, see section titled "References" in Specification. Applicants however have not provided a considerable number of those references to be considered during the examination process. The Examiner respectfully requests that the Applicants provide the references listed but not supplied for consideration. Additionally, the Examiner respectfully requests that the Applicants provide any other material that may be deemed material to the patentability of the Instant Application. A 37 CFR 1.105 Requirement for Information is not being made at this time.

Specification

5. The abstract of the disclosure is objected to because the word "identifiers" is misspelled as "identifers" in paragraph 57 of Instant Specification. Correction is required. See MPEP § 608.01(b).

Appropriate correction is required.

Claim Interpretation

6. For claims which do not expressly disclose the N materials. N is interpreted as any number, including 0. For example, in claims that do not further limiting the number N, N is interpreted as any number,

including 0. For example, claims 2-3 and specify N to be at least a prime number. In this instance N cannot be 0 or 1, or any other non-prime number.

7. Claims 1, 4, and 7 do not specify N. In instances where N is 0, the claims do not perform a simulation because is no material to be simulated.

8. Merely labeling each of the N materials and the microgrid cells is not given patentable weight until such labeling is used for a specific purpose in order to solve a specific problem.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:
Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 1-10 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

9.1 The method claims do not produce a useful, tangible, and concrete **result**. The steps of the method claims do not produce a useful, tangible, and concrete result. They merely recite a software algorithm, *per se*, which, for example, does not display, store, or otherwise provide a useful tangible output. Note exemplary claim 1 which only recites software steps and does not produce a useful tangible and concrete **result**.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:
The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the **enablement requirement**. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As per claim 1, note limitation (g) which recites "advecting the microgrid cells within the microgrid in response to the calculated local velocity conditions". Calculated local velocity conditions are not steps, therefore, they do not appear to cause triggers such as the above-recited advection. How can something respond to a calculation?

As per claim 8, the term "by taking" fails to comply with the enablement requirement. Specifically, it is not understood what is meant by this phrase.

11. Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being **indefinite** for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The following claims have insufficient antecedent basis for their respective limitations:

Claim 1 recites the limitations "the simulation", "the flow of N materials";

Claim 4 recites the limitation "the fluid materials", "the grid";

Claim 7 recites the limitations "the location of the microgrid cells", "the microgrid cells containing different fluid materials";

Claim 8 recites the limitation "the presence of overlapping cells and voids";

Claim 10 recites the limitations "the product of the unique identifiers", "the overlapping cells".

12. The term "satisfactory" in claim 1 is a relative term which renders the claim indefinite. The term " satisfactory " is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

13. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: establishing a relationship between the unique identifiers with respect to equations of motions.

14. The above cited rejections are merely exemplary. The Applicant(s) are respectfully requested to correct all similar errors. Claims not specifically mentioned are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

15. Claims 1, 4, 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Rudman's "A volume-tracking method for incompressible multifluid flows with large density variations".

Rudman teaches: 1. A method for tracking the flow of N materials and their interfaces in a computational domain, the method comprising the steps of:

(a) creating a macrogrid including control volumes on a computational domain in which N materials and their interfaces are to be tracked **(page 360)**;

(b) overlaying a microgrid including microgrid cells upon the macrogrid with each of the microgrid cells being coupled to a control volume **(page 361 fig 1)**;

(c) initializing the macrogrid and control volumes with initial and boundary conditions **(page 360 para 1)**;

(d) assigning a unique identifier to each of the N materials and to the microgrid cells **(page 359 equation 2)**;

(e) calculating volume fractions for the N-materials in the control volumes **(page 372 last para)**;

(f) solve equations of motion upon the macrogrid and control volumes utilizing the calculated volume fractions to arrive at local velocity conditions for the control volumes **(page 359 para 1)**;

(g) advecting the microgrid cells within the microgrid in response to the calculated local velocity conditions in the control volumes such that voids and overlaps of the microgrid cells in the microgrid occur **(page 359 para 1; page 360 last para; page 358 para 1)**;

(h) reallocating the microgrid cells so that only one material is in each microgrid cell to effectively conserve mass and satisfy local fluid fraction gradient values **(page 357 Summary, page 358**

last para, page 360 last para); and

(i) repeating steps (e)-(h) until a satisfactory number of time steps has occurred to complete the simulation **(page 374 last para; page 360 para 1)**.

Rudman teaches: 4. The method of claim 2 wherein modular arithmetic is used to track the fluid materials which are advected into the microgrid cells of the grid **(This is an inherent limitation in view of Claim Interpretation above.)**.

Rudman teaches: 8. A method for tracking cells in a fluid dynamics computation comprising:

assigning unique identifiers to cells located in a grid, the unique identifiers being associated with respective fluid materials **(page 359 equation 2)**;

advecting the cells within a grid in response to local velocity conditions such that some of the cells overlap one another in the grid and voids are created in the grid **(page 359 para 1; page 360 last para; page 358 para 1)**;

and calculating the presence of overlapping cells and voids in the grid by taking a combination of the unique identifiers of each of the cells located at a particular microgrid location **(page 359 para 1; page 360 last para; page 358 para 1)**.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. Claims 2-3, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rudman's "A volume-tracking method for incompressible multifluid flows with large density variations" as applied to claim 1 above, and further in view of Official Notice taken.

MPEP 2106 recites, in part: "**Limitations appearing in the specification but not recited in the claim are not read into the claim.** E-Pass Techs., Inc. v. 3Com Corp., 343 F.3d 1364, 1369, 67 USPQ2d 1947, 1950 (Fed. Cir. 2003) (claims must be interpreted "in view of the specification" **without importing limitations from the specification into the claim**s unnecessarily). In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969). See also In re Zletz, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)"

As per claims 2, 3, and 9, the applied prior-art does not expressly disclose that the unique identifier numbers are prime numbers (claims 2 and 9) or numbers generated by Eulerian quadratic number generator (claim 3). At the time of the invention, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use such numbers because Applicant has not disclosed that the particular features provide an advantage, are used for a particular purpose, or solve a stated problem, **as currently claimed**. It may appear the Specification discloses a specific purpose for the labeling of the items associated therewith. However, the purpose and the method of applying the unique labeling are recited in the claims. Therefore, one of ordinary skill in the art, furthermore, would have expected Applicants' invention to perform equally well with such feature because the choice of labeling does not affect the invention in the applied prior art. Specifically, there is not particular advantage of using either a prime numbers, or a Eulerian quadratic number generator for the unique identifier numbers when such numbers are used merely for labeling and do not solve a specific problem.

17. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rudman's "A volume-tracking method for incompressible multifluid flows with large density variations" as applied to claim 1 above, and further in view of William J. Rider's "Reconstructing Volume Tracking" ("Rider").

As per claim 5, Rudman discloses all limitations of claim 1. Rudman however does not expressly disclose that the number N of materials tracked is at least 3. Rider however discloses an analogous fluid simulation system having the said feature **(page 120 Fig 4 and texts associated therewith)**. It would have been obvious to one of ordinary skill in the art <fluid simulation> at the time of Applicant's invention to combine the references in order to simulate multiple fluids at the same time, rather than doing two fluids at a time, thereby saving time and costs associated therewith. In fact, Rudman gives the motivation on **(page 357 last paragraph: "In the numerical computation of immiscible**

multifluid problems with large density variation [...], there is need of an accurate representation of the interface separating the fluids...").

As per claim 6, Rudman discloses all limitations of claim 1. Rudman however does not expressly disclose that the number N of materials tracked is at least 4. Rider however discloses an analogous fluid simulation system having the said feature **(page 120 eq 1b, 2 when k is equal to 4)**. It would have been obvious to one of ordinary skill in the art <fluid simulation> at the time of Applicant's invention to combine the references in order to simulate multiple fluids at the same time, rather than doing two fluids at a time, thereby saving time and costs associated therewith. In fact, Rudman gives the motivation on **(page 357 last paragraph: "In the numerical computation of immiscible multifluid problems with large density variation [...], there is need of an accurate representation of the interface separating the fluids...").**

As per claim 7, Rudman discloses all limitations of claim 1. Rudman however does not expressly disclose the interfaces between the N materials are tracked by the location of the microgrid cells containing different fluid materials. Rider however discloses an analogous fluid simulation system having the said feature **(page 120 Fig 4 and texts associated therewith)**. It would have been obvious to one of ordinary skill in the art <fluid simulation> at the time of Applicant's invention to combine the references in order to not be limited to the simulation of a single fluid. In fact, Rudman gives the motivation on **(page 357 last paragraph: "In the numerical computation of immiscible multifluid problems with large density variation [...], there is need of an accurate representation of the interface separating the fluids...").**

18. Claims 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rudman's "A volume-tracking method for incompressible multifluid flows with large density variations" as applied to claim 1 above, and further in view of John Strain's "A Fast Modular Semi-Lagrangian Method for Moving Interfaces" ("Strain").

As per claim 10, Rudman discloses all limitations of claim 8. Rudman however does not expressly disclose that modular arithmetic is applied to the product of the unique identifiers of overlapping cells to

determine which fluid materials are present in the overlapping cells. Strain however discloses an analogous fluid simulation system having the said feature **(page 512 abstract)**. It would have been obvious to one of ordinary skill in the art <fluid simulation> at the time of Applicant's invention to combine the references in order to simplify simulation code development for multi-fluid simulations **(Strain: page 512 abstract)**.

Examiner Notes

19. After overcoming any intervening objections and rejections, when the prime numbering and Eulerian quadratic number generating (of claims 2 and 3, respectively) are used as more than mere unique identifier labeling, they may be considered patentable (see, pages 14 line 26 to page 18 line 26).

Conclusion

20. All claims are rejected.

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Silver whose telephone number is (571) 272-8634. The examiner can normally be reached on Monday thru Friday, 10am to 6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on 571-272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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